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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/722,934	11/26/2003	Michael Wayne Lane	YOR920030505US1 (163-21)	9639

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EXAMINER	
WILLIAMS, ALEXANDER O	
ART UNIT	**PAPER NUMBER**
2826	

DATE MAILED: 11/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/722,934	LANE ET AL.	
	Examiner	Art Unit	
	Alexander O. Williams	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-9 and 21-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-9 and 21-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Serial Number: 10/722934 Attorney's Docket #: YOR920030505US1(163-21)
Filing Date: 11/26/03;

Applicant: Lane et al.

Examiner: Alexander Williams

Applicant's Amendment filed 9/19/05 to the election with traverse of Group I (device claims 1-9) filed 6/4/04 is acknowledged.

However, claims 2 and 10-20 have been canceled.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3, 4, 8, 21 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Spitsberg et al. (U.S. Patent # 6,306,524 B1).

1. Spitsberg et al. (figures 1 to 6B) specifically figure 16e show a solid state device comprising: a first material **36 or 34 or 32**; a second material **32 or 34 or 36**; a barrier layer **33** formed between the first material and the second material to prevent a diffusion between the first material and the second material, the barrier layer includes a thermodynamically stable hexagonal close packed metal crystalline form of at least one of **Ru** and **Re (see Table 1)**.

3. The device as recited in claim 1, Spitsberg et al. show wherein the first material **32** is a dielectric and the second material **34** is a metal.

4. The device as recited in claim 1, Spitsberg et al. show wherein the first material **34** is a conductor and the second material is a metal **32**.

8. The device as recited in claim 1, Spitsberg et al. show wherein device is a semiconductor device and the first material includes a semiconductor material.

21. Spitsberg et al. (figures 1 to 6B) specifically figure 16e show a solid state device comprising: a first material **36 or 34 or 32**; a second material **32 or 34 or 36**; a barrier layer **33** formed between the first material and the second material to prevent a diffusion between the first material and the second material, the barrier layer includes a thermodynamically stable hexagonal closed packed metal crystalline form of **Ru (see Table 1)**.

22. Spitsberg et al. (figures 1 to 6B) specifically figure 16e show a solid state device comprising: a first material **36 or 34 or 32**; a second material **32 or 34 or 36**; a barrier layer **33** formed between the first material and the second material to prevent a diffusion between the first material and the second material, the barrier layer includes a thermodynamically stable hexagonal closed packed metal crystalline form of **Re (see Table 1)**.

(4) The present invention as set forth in FIG. 4 provides for an airfoil 30 for use in a turbine section of a gas turbine engine comprised of a superalloy substrate 32. Although the substrate airfoil may be any superalloy, including cobalt-based superalloys, Ni-based superalloys and Fe-based superalloys, preferred compositions include Rene N5, Rene 80, Rene 142 and Rene N6, four well-known airfoil alloys. Overlying the superalloy substrate is a tightly adherent diffusion barrier layer 33. Overlying the diffusion barrier layer 33 is a coating 34 having a high concentration of aluminum. Typical coatings include MCrAlY(X) coatings and diffusion

aluminides of nickel. These coatings 34 may be used as environmental coatings or as bond coats. When used as bond coats, a ceramic topcoat 36, typically 7YSZ, is applied as a thermal barrier coating to allow performance at even higher temperatures, as shown in FIG. 4. When used as an environmental coat, as shown in FIG. 5, the MCrAlY(X) coatings and/or the aluminides form the outermost surface of the airfoil.

(5) The diffusion barrier layer 33 of the present invention should have low diffusion permeability for aluminum from the coating and preferably for refractory elements from the substrate as well. In reality, some diffusion of Al will occur across layer 33 leading to a slow phase transformation that can ultimately destroy the layer and thus accelerate diffusion between the substrate 32 and coating 34. Because of this, the composition of layer 33 should be stabilized with elements that decrease standard Gibbs-free energy of the diffusion barrier layer and which slow the diffusion of elements responsible for phase transformations so that the kinetics of the phase transformation will be as slow as possible. Unless otherwise specified below, the composition of the diffusion barrier layer will be given in atomic percent, "a/o".

(6) The diffusion barrier layer 33 of the present invention ideally should function as more than just a diffusion barrier to slow or prevent the diffusion of certain atomic species across and through it, although this effect on diffusion of Al in the coating 34 is its primary function. It also is desirable that the diffusion barrier also retard or prevent the diffusion of refractory elements from the substrate 32 into the aluminide coating. In addition, this diffusion barrier layer 33 must be essentially chemically compatible with both the aluminum-rich coating 34 and the superalloy substrate 32. Specifically, no low melting phases or other deleterious phases must result from chemical interactions at high temperatures. The diffusion barrier layer 33 must also be thermodynamically stable so that phase transformations occur very slowly, if at all. The diffusion barrier layer 33 should be sufficiently bonded to both coating 34 and to superalloy substrate 32 so as not to cause spallation during thermal cycling. The diffusion barrier layer 33 should have a coefficient of thermal expansion close to the coefficient of thermal expansions of both aluminide coating 34 and substrate 32. It must also have sufficient strength at

interfaces with the aluminide coating and with the substrate so that stresses resulting from thermal cycling will not cause fatigue failures.

(7) Several alloy compositions satisfy at least some of the conditions for forming a diffusion barrier layer. The composition of these alloys are given as Table 1.

(8) One class of alloys tested were simple metallic solid solution alloys containing Ru with melting temperatures well above that of Ni-based superalloy substrates. These high melting point materials have relatively low diffusion rates for Al. Alloys representative of this type include DB19-22 in Table 1. Each of these single phase solid solution alloys should dissolve some Al from a NiAl layer 34. However, because of their increased melting temperatures, the diffusivity of Al is lowered.

(9) Alloys in which Ru is not the predominant element including at least about 10 a/o of Ru are thus expected to form an excellent diffusion barrier between a nickel-based substrate and an aluminum-containing outer layer. In preferred embodiments, such solid solution diffusion barriers should include Ru up to about 20 a/o. Solid solutions in which Ru does predominate include about 80 a/o Ru and higher. At about 20 a/o Ru, the solubility limit of Ru in the fcc Ni lattice is approached. At about 80% Ru, a hexagonal structure of Ru and Ni is stabilized. A hexagonal structure is also established in Co-Ru-Cr alloys in the range of 15-35 a/o Ru, up to about 10% Cr and the balance Co and incidental impurities, and preferably at about 30 a/o Ru and 5 a/o Cr with the balance Co. In the compositional range of between about 20 a/o Ru and about 80 a/o Ru, two-phase mixtures of solid solution alloys may be formed. These are expected to also serve as diffusion barriers. The remaining elements in the preferred embodiments are selected from the group consisting of Ni, Co, Cr and combinations thereof. Ru may be added to a bcc-Cr matrix in the amount of 10-20 a/o to yield a stable diffusion barrier layer. Small amounts of other elements may be included in the alloy in amounts that do not affect the characteristics and the performance of the alloy as a diffusion barrier that adheres tightly to the underlying substrate.

Initially, and with respect to claims 6, 7 and 23, note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases as the above case law makes clear.

Claims 6, 7, 9, 23 to 25 and 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Spitsberg et al. (U.S. Patent # 6,306,524 B1).

9. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

As to claims 6, 7 and 23, as to the grounds of rejection under section 103, see MPEP § 2113.

Claims 5 and 26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Spitsberg et al. (U.S. Patent # 6,306,524 B1) in view of Matsuse et al. (U.S. Patent Application Publication # 2002/0197856 A1).

Spitsberg et al. is cited for showing the features of the claimed invention as detailed above, but fail to explicitly show wherein the metal form includes a hexagonal close packed structure and wherein the metal is copper.

Matsuse et al. Is cited for showing a barrier film wiring structure and electrodes of semiconductors device having a barrier film. Specifically, Matsuse et al. (figures 1 to 14) specifically figure 1 discloses A solid state device comprising: a first material **8 or 15 or 4**; a second material **16**; a barrier layer **14** formed between the first material and the second material to prevent a diffusion between the first material and the second material, the metal form includes a hexagonal close packed structure for the purpose of having a low amount of oxygen contamination and high thermal stability.

5 and 26. The device as recited in claim 1 or claim 23, the combination with Matsuse et al. show wherein the first material **8, 15 or 4** includes copper.

Therefore, it would have been obvious to one of ordinary skill in the art to use Matsuse et al.'s metal form including a hexagonal close packed structure to modify Spitsberg et al.'s metal form for the purpose of having a low amount of oxygen contamination and high thermal stability.

Response

Applicant's arguments filed 9/19/05 have been fully considered, but are moot in view of the new grounds of rejections detailed above.

The insertion of Applicant's additional claimed language, for example, "" cause for further search and consideration to make this action final.

Applicant's amendment necessitated the new grounds of rejection. Accordingly, **THIS ACTION IS MADE FINAL**. See M.P.E.P. ∋ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 C.F.R. ∋ 1.136(a).

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE DATE OF THIS ACTION. IN THE EVENT A FIRST RESPONSE IS FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED STATUTORY PERIOD, THEN THE SHORTENED STATUTORY PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 C.F.R. ∋ 1.136(a) WILL BE CALCULATED FROM THE MAILING DATE OF THE ADVISORY ACTION. IN NO EVENT WILL THE STATUTORY PERIOD FOR RESPONSE EXPIRE LATER THAN SIX MONTHS FROM THE DATE OF THIS FINAL ACTION.

Field of Search	Date
U.S. Class and subclass: 257/751,758,773,774,759,760,762 428/621,632,651,652,654,670,680	8/18/04 2/7/05 6/14/05 11/4/05
Other Documentation: foreign patents and literature in 257/751,758,773,774,759,760,762	8/18/04 2/7/05 6/14/05 11/4/05
Electronic data base(s): U.S. Patents EAST	8/18/04 2/7/05 6/14/05 11/4/05

Any inquiry concerning this communication or earlier communications form the examiner should be directed to Alexander O Williams whose telephone number is (571) 272 1924. The examiner can normally be reached on M-F 6:30 AM -7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272 1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AOW
11/4/05

Primary Patent Examiner
Alexander O. Williams